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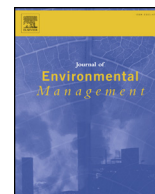
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Research article

Evaluating the success of public participation in integrated catchment management

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ABSTRACT

Recognition of the need to manage the water environment in more holistic ways has resulted in the global growth of Integrated Catchment Management (ICM). ICM is characterised by horizontal integration, encouraging interdisciplinary working between traditionally disparate management sectors, alongside vertical integration, characterised by the engagement of communities; central is the promotion of participatory governance and management decision-making. ICM has been translated into policy through, for example, the EU Water Framework Directive and at a national level by policies such as the Catchment Based Approach in England. Research exploring the implementation of these policies has reported success at a catchment level, but further research is required to explore practices of management at local level within catchments. This paper presents the findings of participatory research undertaken with a catchment partnership in the northeast of England to explore the integration of top-down policy translation with how local communities interact with management agencies at sub-catchment scale (a bottom-up perspective). The research found that supra-catchment scale drivers dominate the vertical interplay between management systems at more local levels. These drivers embed traditional practices of management, which establishes public participation as a barrier to delivery of top-down management objectives, resulting in practices that exclude communities and participatory movements at the local level. Although collaboration between agencies at the partnership scale offers a potential solution to overcoming these obstacles, the paper recommends changes to supra-catchment governance structures to encourage flexibility in developing local participatory movements as assets. Further research is necessary to develop new practices of management to integrate local people more effectively into the management process.

1. Introduction

The past two decades have seen increasing global efforts to adopt more holistic and integrated approaches to manage water environments (Watson and Howe, 2006), for example in Australia (Bellamy et al., 2002), Africa (Dungumaro and Madulu, 2003), the USA (Ballweber, 2006), and across the EU (Mouratiadou and Moran, 2007). Commonly referred to as Integrated Catchment Management (ICM) (Lerner and Zheng, 2011), these approaches use hydrological catchments as natural organising units for interventions in the landscape and natural processes (Fenemor et al., 2011). They are typified by the replacement of often fragmented and sectorally distinct approaches (Butterworth et al., 2010; Watson et al., 2009) with new, integrated land-water practices grounded in participation, shared knowledge, and social learning (Allen et al., 2011; Mitchell and Hollick, 1993; Watson and Howe, 2006).

As ICM approaches have become more widely adopted (Rouillard

and Spray, 2017), studies have reported success in implementing ICM principles (Collins et al., 2007; Cook et al., 2013a). However, current research is focused predominantly on the supra-, or large catchment scale, and has typically adopted a top-down perspective (Sabatier, 1986) to assessing how effectively policy has been implemented (Watson, 2014). This has resulted in a gap in our understanding of ICM implementation at the local, or sub-catchment, scale (Mees et al., 2017), where issues have been raised about how meaningful and extensive ICM-based participation is (Mouratiadou and Moran, 2007), and whether participatory policies can overcome traditional practices of management (Cook et al., 2013b; Watson, 2014).

The purpose of this paper is to address this existing research gap by exploring the nature of integrated management practices at the local scale. In particular we look to determine how supra-catchment drivers of participation are translated into local participatory practices, and how these practices impact on communities within the catchment area.

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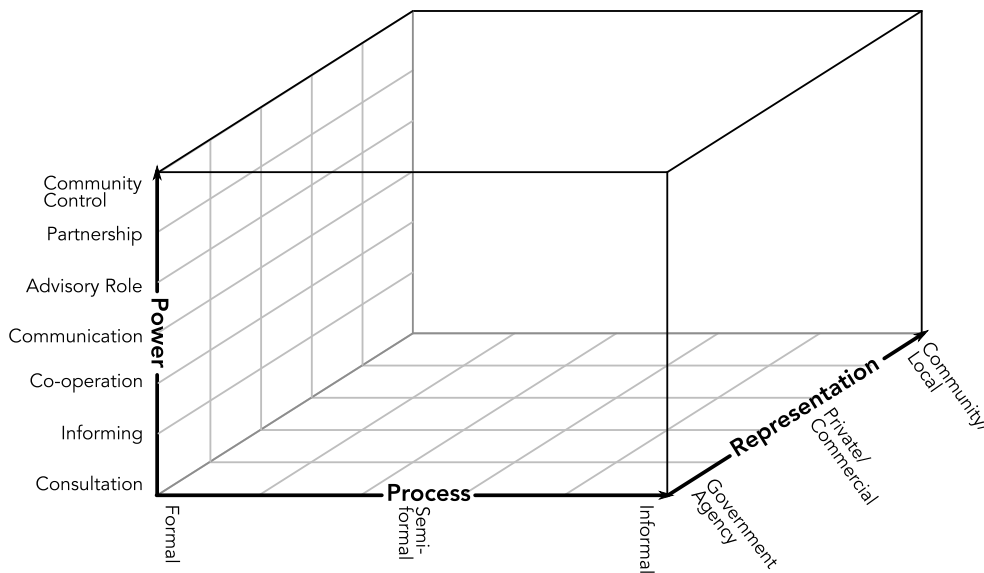


Fig. 1. Plummer and FitzGibbon's (2004) conceptual model of co-operative management. The degree of participation is assessed dependent upon and the formal or informal nature of the processes adopted (x axis), the degree to which power is transferred between groups (y axis), and which groups achieve representation (z axis) (Adapted from Plummer and FitzGibbon, 2004; and Pomeroy and Berkes, 1997).

In contrast to previous research we adopt both a 'top-down' and 'bottom-up' approach to explore the governance arrangements and working practices of a catchment management partnership, and the knowledge, experiences, and aspirations of the communities living within the area. To undertake this analysis we use the case study of a sub-catchment scale management partnership in the Northeast of England. We adopt a pragmatic, mixed methods research approach grounded in the concepts of participatory research, intended to engage with and explore a range of differing perspectives on catchment management and participation. This aims to (i) examine how the catchment partnership functions and how catchment interventions are identified, planned, and implemented; (ii) explore how community participation is conceptualised, and how it is enacted through the practices of management demonstrated by the partnership; and (iii) explore how local communities and individuals conceptualise their environment and how it should be managed, and how this interfaces with the work of the partnership.

The research presented is some of the first to consider interactions between local communities and management agencies in the day-to-day management of the environment, and how more active community participation can contribute to more effective ICM. This research is therefore crucial to determining if aspirations for community engagement are being met, and what barriers and opportunities exist for integrating people and communities into ICM practices at the local scale.

In the next section we explore ICM, and public participation in management, in more detail.

2. Background to ICM

ICM as a term is often left purposefully generic, such as the definition adopted by Lerner and Zheng (2011) as "*the fully integrated management of the land, water and human activities in [...] catchments*" (p. 2638). This reflects the multiple objectives of ICM and the way in which it is operationalised (Butterworth et al., 2010). Taking a more detailed perspective, Kilvington et al. (2011) and Varis et al. (2014) argue that ICM represents two fundamental principles: horizontal integration, across and between management organisations from different disciplines, for example flood risk, spatial planning, or agriculture; and vertical integration between experts, policymakers, and the public. Here, we review the vertical integration component of ICM, exploring how traditional and ICM approaches to management differ in how they integrate public participation into environmental decision-making.

We acknowledge that public participation in environmental

decision making is not a new phenomenon, and did not emerge specifically with a proposed shift towards ICM approaches (Reed, 2008). However, the ways in which traditional catchment management and ICM integrate people into practices of management are distinctly different (Eden, 1996). Participatory activities in traditional management are characterised by hierarchical arrangements, the dominance of expert-led decision making, and asymmetrical power relationships between management agencies and the public (Lane, 2012; Watson et al., 2009). In these circumstances participation is often heavily controlled and choreographed, and usually intended to identify public preferences for, or to 'sell', a preferred option (Warner, 2011). In contrast, ICM is characterised by a philosophy of participation aimed at dispersing and localising decision-making power (Marshall et al., 2010; Mitchell and Hollick, 1993) and combining officially sanctioned, scientific knowledge with local knowledges and perspectives (Jemberu et al., 2018; Stringer and Reed, 2007). Participation in this context is not a mechanistic target to be achieved, but an ongoing **process** which represents a fundamental part of catchment management activities (Reed, 2008).

The participatory nature of catchment management is often evaluated using conceptual models, such as Arnstein's (1969) 'Ladder of Participation'. This model classifies participation on a continuum between manipulative non-participation through to total citizen control. However, Collins and Ison (2009) argue that the model represents an over-simplified, power-focused model of participation and hence fails to consider the complex, and often non-linear, interactions between agencies and communities over time (Tritter and McCallum, 2006). In this way failure is implied if total citizen control is not obtained, even though a model of total citizen control is not always desirable or achievable (Hayward et al., 2004).

Plummer and FitzGibbon (2004), drawing on Berkes (1994) and Pomeroy and Berkes (1997), proposed a multi-dimensional model of co-operative management (Fig. 1) which extends the original power-relationships concept by exploring the interrelationships between representation, power and process. This model also considers which bodies achieve representation and the nature of participatory processes. Assessing participatory activities against power, representation and process builds on criticisms of Arnstein's original ladder, acknowledging the additional complexity of who participates and how. In this paper, we use this model to assess the degree and nature of participation in ICM.

2.1. Engagement of communities in ICM

Policy frameworks have evolved to embrace ICM and encourage public participation. The EU Water Framework Directive (WFD) focuses on both the integrated management of catchment systems (Watson and Howe, 2006) and public participation (Fritsch, 2017; Nones, 2015; Robins et al., 2017). Article 14 of the WFD requires public information supply and consultation through formal processes and encourages public participation in implementing interventions. The WFD also states that “more [public participation] may be useful to reach the objective of the directive” (Newig et al., 2014, p. 279), and so participation is expected from the general public and not just the relatively small pool of expert stakeholders typical of traditional management (Reed, 2008).

Expectations for engagement in practice can be explored by examining how the WFD is translated into policy across the EU. In England, the WFD has been translated into national policy through CaBA (Defra, 2013; Harris, 2013; Watson, 2014). This policy was intended to effectively implement the public engagement principles, linking high level policy to local level practice (Harris, 2013; Starkey and Parkin, 2015; Varis et al., 2014). CaBA envisions the management process as a series of nested and integrated practices operating at different scales. Three scales are identified, each characterised by differing approaches to participation (Fig. 2). The highest, supra-catchment, scale is the national or a river basin scale, of which there are 11 in England and Wales (Watson and Howe, 2006). CaBA work at this scale is dominated by expert-led management organisations and participatory focus is on informing and consulting (Fig. 1). The second scale is that of the individual catchment, 80 of which are defined under the WFD in England and Wales (Defra, 2013). This is the scale at which the majority of CaBA activity is focused because it has been argued that this is “large enough to add value at a strategic scale but small enough to encourage and support local scale engagement and action” (Defra, 2013, p. 10). Management tends to be undertaken through Catchment Partnerships (CPs) which act as collaborative fora for diverse catchment stakeholders including local authorities, management agencies, and third sector organisations representing local groups or specific issues (Harris, 2013). The third, and smallest, scale is the sub-catchment or local scale. This consists of individual locations or communities where the practices of management are applied and where individual catchment interventions are implemented. Management activities are usually undertaken by the higher level catchment partnership, however in practice in the UK and elsewhere some sub-catchment partnerships have also been formed specifically to address local issues (Environment Agency, 2015). The catchment and sub-catchment (local) scale are where participatory activities are intended to occur, including “identifying, planning and acting [...] with a range of stakeholders and members of the public as appropriate” (Defra p. 6). Participation is characterised by increasing degrees of local control (Fig. 1 Advisory Role upwards), with CaBA guidance stating that participatory practices at this scale should include direct citizen involvement in both plan making and the local implementation of interventions (Defra, 2013).

ICM has therefore emerged as a mechanism for horizontal and vertical integration, embedded within EU and UK catchment management policy, and CPs have developed as collaborative fora for its implementation. However, outside of exploring horizontal and vertical integration within relatively formal structures of management there has been relatively little study of how effectively policy frameworks such as CaBA (Fig. 2) implement vertical integration and community participation on the ground (Cook et al., 2013b, 2013a, 2012). Here, we look to explore this issue, working together at the sub-catchment (local) scale both with a ICM partnership and with the communities occupying the catchment being managed. We look to examine vertical integration between the partnership and affected communities, exploring how practices of participation are enacted, and the influence of internal and external drivers.

3. Methods

3.1. Research approach

In 2015–16 research was undertaken to explore ICM practices implemented by a catchment partnership in northeast England (see Section 3.2). We explored both top-down and bottom-up perspectives using a mixed-methods approach which drew on research into participatory working with catchment groups (Bracken et al., 2016; Lane et al., 2011; Waterton et al., 2011; Whitman et al., 2015) and acknowledged the importance of exploring and understanding community-based knowledges (Bracken et al., 2015). The range of methods was invaluable in gaining community trust, identifying research participants, and obtaining a wider understanding of community concerns and aspirations.

3.1.1. Data collection

Our focus was on recording and understanding the work of the catchment partnership and its relevant partners (see [Supplementary Information](#)), but also local knowledge, attitudes and aspirations of the communities within the area (Section 3). To do this we adopted a pragmatic, mixed-methods approach to collect as wide a range of data as possible (Table 1).

Participatory mapping (McCall, 2008) and walking interviews (Evans and Jones, 2011) were used to explore individual's local knowledge and experiences within the context of their local environment.

Participatory mapping has been shown to be a valuable tool in assessing local needs and analysing local problems, perceptions, and priorities (Dekens, 2007). Participatory mapping was conducted on an individual basis, in the form of unstructured interviews, and through open workshops and drop-in sessions at existing community events. The majority of participants in these sessions were male, aged between 44 and 65, and retired, although they came from a variety of professional backgrounds. This reflects both the composition of the communities within which the research took place and also the availability of participants during the research period.

Discussions were participant-driven, using the theme of ‘what do you know about the environment of the Twizell Burn?’ as a broad introductory framework, and with a hard-copy map of the local area to provide context and an aid to discussions. Participants were encouraged to discuss their knowledge and opinions, using the map as a prompt, with locations or extents hand drawn on the maps and annotated. Additions to the maps were digitised and integrated with transcribed discussions to produce a qualitative GIS as proposed by Cope and Elwood (2009). Interview discussions were audio recorded, although discussions at drop-ins and community workshops were not, with the interviewer indicating locations on the map to which the discussions could be linked during analysis. The locationality of knowledge, the relationship between the knowledge being collected and the locations being referred to within the catchment, was the principle focus of the interviews and other discussions and recording this effectively was therefore essential. Formal recording or analysis of participants speech, for example voice tone or emotions, was not carried out as this analysis would not have been applicable to the wider dataset due to the diverse nature of the interactions, with some being recorded and transcribed and others not.

Participatory mapping was supplemented by ‘walking interviews’. These enabled explorations of how knowledge and experience was situated or concentrated within different parts of the catchment through physically placing participants within their environment (Jones et al., 2008). Walking interviews were also unstructured, with the routes of walks determined by the interviewee, natural go-alongs (Kusenbach, 2003) or participatory walking interviews (Clark and Emmel, 2008) using the typology developed by Evans and Jones (2011). Walking interviews were undertaken on a one-to-one basis. Interviews were GPS-

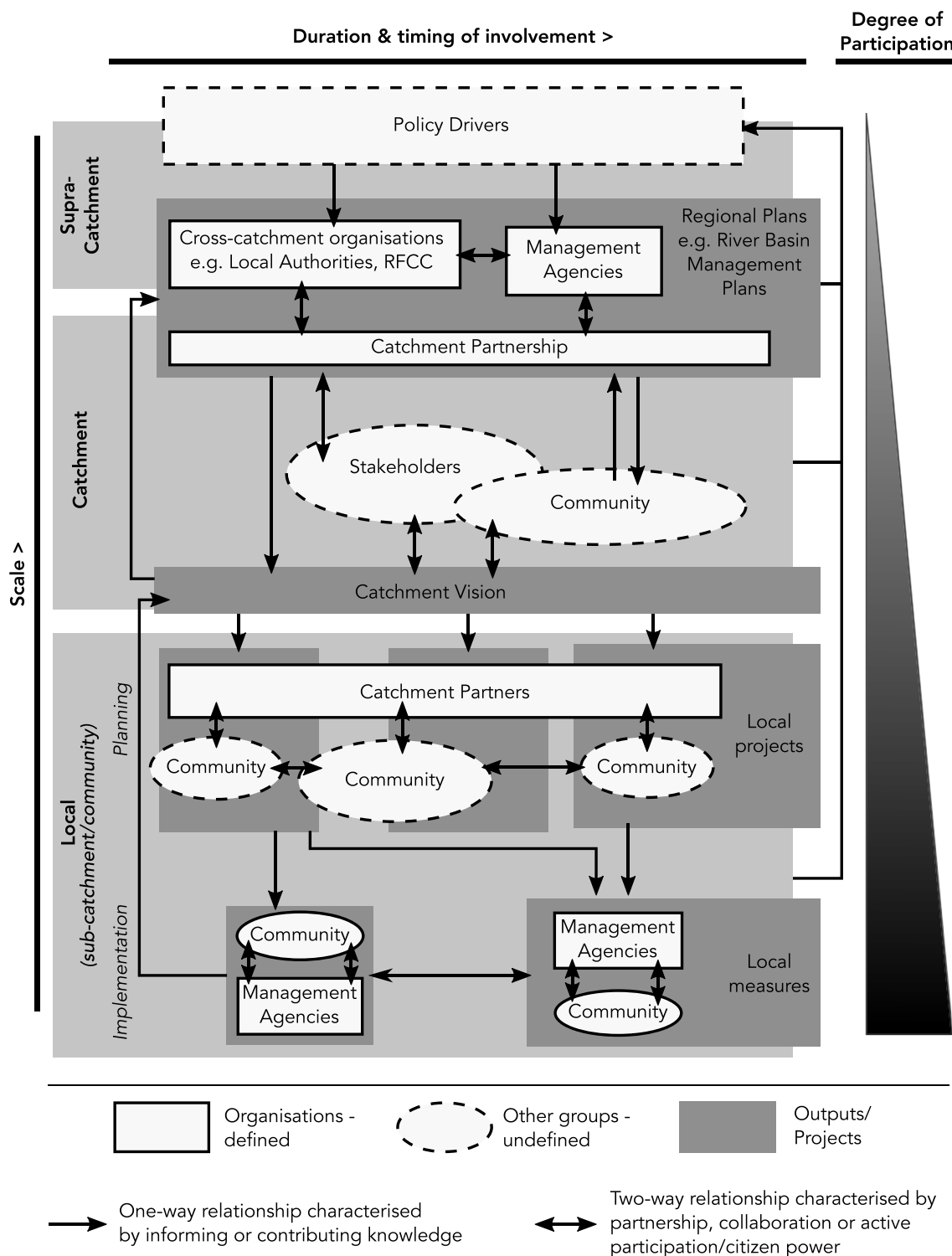


Fig. 2. A conceptual model showing the principle drivers, outputs, organisations, and the participatory nature of their relationships which underpin Integrated Catchment Management as conceived through the UK Catchment Based Approach. The x axis indicates the broad duration and timing of different relationships, whilst the y axis indicates catchment scale.

tracked and audio-recorded to allow subsequent locational analysis of participant's knowledge during data analysis, as demonstrated by Jones and Evans (2012). Employing these methods allowed discussions to be free and participant-focused and uninterrupted by note taking.

Where possible we also undertook less structured ethnography. This included using local community spaces such as community centres to informally discuss the research activities with local residents, staff and

patrons. We also participated in meetings of the catchment partnership, engaged in the planning and development of several catchment interventions and participated in a regular walking group. In this way our research was grounded in the principles of ethnography and participant observation, qualitative methodologies based on the observation and participation of researchers in the activities being studied (Atkinson and Hammersley, 1994). These methods enabled researchers to explore

Table 1

The research methods adopted during the study and the data collected. Data was collected predominantly between spring 2015 and summer 2016 during fieldwork in the Twizell Burn Catchment and with the [Greening the Twizell Partnership](#) (see Section 3.2).

Data Type	Source	Quantity/Data
Participatory Mapping	Interview transcripts and annotated mapping (transferred to GIS data by researchers) from one-to-one participatory mapping interviews. Annotated mapping and text comments ((transferred to GIS data by researchers) from participants at three drop-in sessions held in support of partnership activities	4 Three drop-in sessions held at local community centre to support partnership activities.
Walking Interviews	Interview transcripts and GPS trace of route from walking interviews. Supported by post-interview notes taken by researcher.	2
Community Ethnography	Ongoing community participation between December 2015 and March 2016, including attending community cafes, and participation in community walking groups.	
Ethnography	Participation in Catchment Partnership activities between May 2015 and September 2016. In particular attendance at Steering Group meetings and involvement in the planning and/or implementation management projects. Ongoing note-taking from researchers about their interactions with community members. Ongoing note taking from researchers Notes from meetings Reports and documentation from management agencies	

participants' points of view and what their actions or behaviours meant within the context of their environment (Gobo, 2011).

No formal data recording took place during the ethnographic research. Instead, the researchers maintained detailed field notebooks of interactions that focused on who had participated in discussions, the main interactions between different individuals and organisations, and how decisions were made. Notes were supported by examination of official meeting minutes and documents arising from the work of the catchment partnership.

3.1.2. Data analysis

The empirical data collected during the study (Section 4) represented an unstructured and highly diverse, 'format messy' dataset consisting of locational data, transcripts of interviews, participatory mapping, and official documents. The nature of the dataset, whereby data on particular locations or regarding particular issues might be drawn from multiple sources and/or data formats made the adoption of a single, formal method of analysis difficult. To analyse these data we therefore adopted a pragmatic, grounded theory and grounded visualisation approach following Charmaz (2011) and Knigge and Cope (2006). This approach looks to integrate diverse empirical material in a flexible, and reflexive, way both during and after the data collection. The focus of the analysis was on identifying key knowledge and themes to explore the practices of management demonstrated and experienced by local communities.

3.2. The study area: the Twizell Burn catchment

The research was undertaken in the Twizell Burn, a tributary of the River Wear located in northeast England, UK (Fig. 3), an area managed by the Wear Catchment Partnership; a catchment organisation established officially under the CaBA. The catchment is mixed urban-rural and is heavily influenced by historic mining activity, both deep pits and more recent opencast. The water environment reflects its history: it is classified under the WFD as heavily modified and achieves only moderate ecological status (Environment Agency, 2018) as a result of sewage outflows, agricultural pollution, and the dewatering of historic mine workings (Groundworks NE and Cumbria, 2015). There is a history of management intervention in the upper catchment to remediate the effects of historic mining activity (Jarvis and Younger, 1999).

4. Results

In this section we initially adopt a top-down perspective to present the governance structures which shape management within the

catchment, and the practices of management shown by the agencies working through a local partnership. Secondly, we adopt a bottom-up perspective, to present the viewpoint of the local community, focusing particularly on local knowledge and engagement with the catchment of the Twizell Burn, and the interactions of local participants with the activities of the partnership.

4.1. Catchment governance: establishing the [Greening the Twizell Partnership](#)

In 2015 Durham County Council (DCC), the local spatial planning authority, commissioned Groundworks NE & Cumbria (Groundworks), a local third sector organisation, to prepare a Green Infrastructure Masterplan for the Twizell Burn. The aim of this plan was to develop an integrated strategy for how the catchment should be managed by the diverse range of agencies with management duties or interests in the area (Groundworks NE and Cumbria, 2015). This work was founded on a period of public consultation, undertaken by Groundworks between October and December 2015. This consultation included four public meetings and an online questionnaire survey undertaken with communities across the catchment and in urban areas immediately adjacent; approximately 100 people were engaged by this process (Groundworks NE and Cumbria, 2015). Four workshops were also held between professional and community organisations within the area. Information derived from the exercise was used to develop the Green Infrastructure Masterplan, which identified a wide range of potential opportunities for integrated management of the Twizell Burn catchment (Groundworks NE and Cumbria, 2015). A key proposal was to establish a sub-catchment based partnership, the '[Greening the Twizell Partnership](#)' (GtTP), charged with delivering the proposed management interventions. The aspiration of the partnership reflected both the ethos of collaborative management laid out in the CaBA, but also the participatory philosophy of wider ICM concepts:

*"The purpose of the Partnership is to be **representative of stakeholders and the community** who are interested in making a difference in the Twizell catchment area [and to] **work together** to [...] meet the vision and objectives for the Twizell burn"* (Groundworks NE and Cumbria, 2015, p. 126 - emphasis added).

The GtTP was established in 2015 and was initially chaired by the Wear Rivers Trust (WRT), a local third sector environmental organisation and chair of the River Wear Catchment Partnership, the CaBA partnership at the spatial scale above that of the study area. Other partners included the Environment Agency (EA) and Northumbrian Water Group (NWG), Durham County Council (DCC) and Stanley local

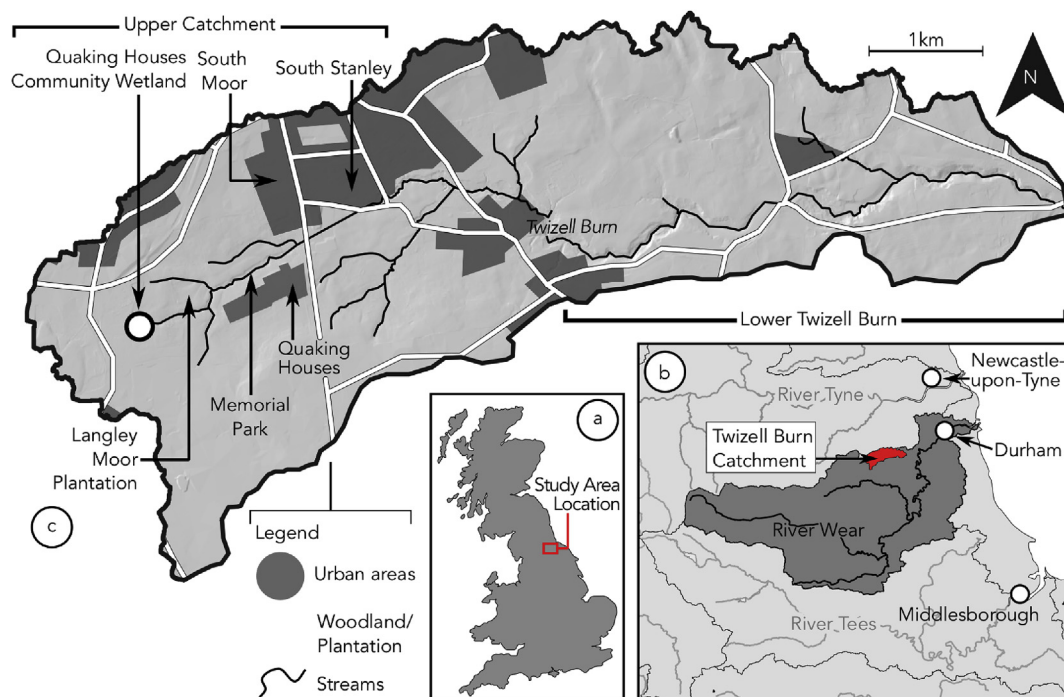


Fig. 3. (a) The location of the study area within (b) the catchment of the River Wear, and an overview of the Twizell Burn catchment showing the location of places referred to in the text.

town council. The partnership was supported by an engineering firm, Fairhurst Environmental, contracted by DCC, and Groundworks. Public representation was through the attendance of two elected local councillors, one of whom took over as chair of the GtTP steering group in 2017. Further information on partner organisations can be found in the [Supplementary Information to this paper](#).

The GtTP's aim, outlined in the partnership agreement was:

“to improve environmental sustainability in the area surrounding the River Twizell through community engagement, and collaborative working between relevant organisations and institutions.” (GtTP, Personal Communication)

4.2. Catchment management practices: who participated and how?

Six principal interventions were planned and/or implemented by the GtTP during the research period (for details see [Supplementary Information](#)). Of these, two were ‘bundles’ of interventions comprising smaller interventions connected either by location, in the case of the South Moor Regeneration Works, or by focus, in the case of the Upper Catchment Works.

The interventions were predominantly carried out by two bodies: WRT undertook works focused principally on water quality and biodiversity in the lower parts of Twizell Burn (Fish Passage Works and Habitat Improvements) and distributed across tributaries in the upper catchment (Upper Catchment Works). Works by DCC, working together with Fairhurst Environmental, centred on the area of South Moor. These works concentrated on the general rehabilitation of the urban area including housing regeneration, the retrofitting of Sustainable Drainage Systems (SuDS), with multiple benefits including greening a high density urban area with improvement of downstream water quality and the installation of a heritage trail to illustrate the area's World War 1 heritage.

The practices of participation were distinct between the two agencies. Some limited consultation was undertaken by the WRT with the local angling club to identify locations within the lower Twizell Burn where habitat improvements and the installation of fish passes were

necessary. This was informal and based on private contacts between WRT and the angling club; there was no public involvement in the detailed planning and implementation of these measures. In the upper catchment there was no participation in the planning of interventions which were based on scientific data and expert knowledge alone. Once these works were designed and funding had been obtained, volunteers were used to facilitate implementation. Volunteers had no role in decision-making and no long-term engagement was planned or carried out. Interventions were intended to be low maintenance and require little or no future intervention.

For the South Stanley Sustainable Drainage intervention our participatory community based research, which included concerns and aspirations for the proposed works (Section 4.3), could not be used to inform the project due to strict project scoping requirements set by the funder (see Section 5). As a result the proposal was based entirely on scientific data and expert knowledge.

In contrast, the South Moor Regeneration works included extended, formal consultation processes in their planning phases. Local residents had opportunities to comment on proposals, with views used to inform development of the final design. Consultation continued during implementation of these works and local residents developed a semi-formal co-operative arrangement with DCC staff to help facilitate interventions. This relationship has been sustained and continues to function at South Moor.

Only the development of the South Moor Heritage Trail saw deeper, less formal participation, bordering on local control. The planning and implementation of the trail was informed by a partnership between DCC and local community groups (for example walking and history groups) which collected archival data on the local area and determined the route for the circular walk. Ongoing engagement includes a community-controlled website and blog to document the development of the route and its use.

4.3. Opportunities for local knowledge, engagement, and participation in the Twizell Burn catchment

Results showed particular engagement with issues of flooding and

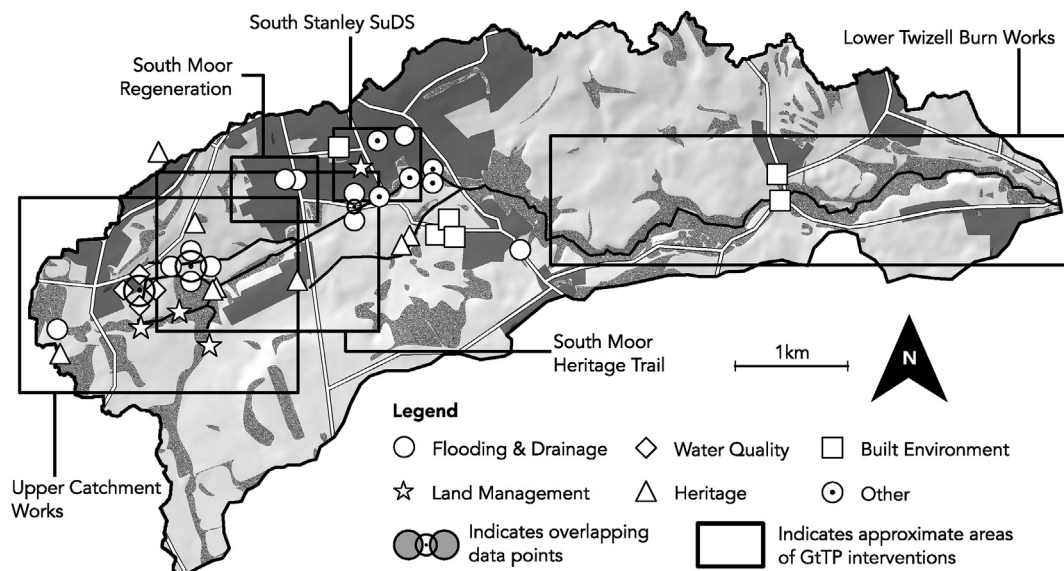


Fig. 4. Distribution and classification of local knowledge about the Twizell Burn and its catchment collected during the participatory research. Data is displayed in point format even though some data represents knowledge distributed across an area. Boxes show the spatial relationship between local knowledge collected during the participatory research and the GtTP interventions discussed in Section 3.2.

drainage across the catchment, as well as land management and the amenity value of the local environment (Fig. 4). These latter issues were often conflated as participants were predominantly interested in land management to allow greater access to the burn, for example the establishment of rights of way and access gates.

Knowledge of flooding and drainage emerged from routine local problems, such as blocked drains or highway runoff, but also included recent fluvial flood events. Participants were keen to discuss flood management, for example highlighting increases in localised surface water flooding related to new housing developments and resulting increased areas of impermeable surface. Several participants showed detailed understandings of the impact of historical development on the hydrology of the catchment, providing information on the course of historically culverted watercourses and identifying inaccuracies in GtTP mapping of the catchment extent.

Only a minority of participants highlighted issues of water quality or the creation of habitats. Such information predominantly related to areas of the upper catchment historically affected by minewater run-off (although this was not seen as a current problem), or sewage discharged from Combined Sewer Overflows (CSOs). These issues were noted because of their impact on the amenity value of the stream, rather than on water quality itself.

4.3.1. Engagement with *Greening the Twizell Partnership* activities

Participants reported little or no engagement with the initial consultation workshops undertaken by Groundworks for the Green Infrastructure Masterplan; although some felt they had been actively excluded. One participant expressed anger because he had attempted to contribute local knowledge of the catchment extent and drainage pathways, derived from his local knowledge, during the workshop. He felt that his knowledge had been rejected by facilitators because his information, based on an ‘on the ground’ knowledge of the local hydrology, conflicted with the official maps derived from national scale mapping. He felt his knowledge was dismissed because it was not ‘official’ and therefore could not be correct.

Almost all participants felt that no information on the GtTP, its vision for the catchment, or details of any of the proposed interventions had been communicated to them. Some participants had received information in an ad-hoc fashion through personal contacts with agency staff, but this was often fragmentary or out of date. Some participants in the upper catchment contrasted the lack of engagement with the GtTP

with the historic construction of the Quaking Houses Community Wetland (Fig. 3), a collaborative project between the Quaking Houses Environmental Trust (a disbanded local environmental group), and Newcastle University. The wetland had been constructed to treat contaminated minewater; a locally identified environmental issue (Jarvis and Younger, 1999). Whereas the Quaking Houses Wetland had been a community-led research project (Kemp and Griffiths, 1999), the lack of contact from the GtTP, particularly as some of the proposed interventions involved replacing the now derelict Quaking Houses Wetland, made them feel actively excluded from the works being undertaken.

The longer-term outcomes of the interventions were also a source of concern. Previous one-off agency interventions were dubbed ‘helicopter projects’, where management agencies landed to undertake capital works before taking off again. These interventions resulted in only short-term gains, unsupported by ongoing community activity. These previous projects were contrasted unfavourably with the GtTP interventions, particularly as no information was provided by the GtTP about their low-maintenance designs or their intended lifespan. As well as having limited local benefits, these interventions were perceived to exclude local people. This was because time invested by individuals was essentially wasted once the management organisations moved on. These feelings were compounded by the fact that none of the participants felt that local communities were able to take longer-term ownership of interventions.

5. Discussion

The results indicate that the practices of management and participation demonstrated by the GtTP were dominated by top-down, hierarchical approaches and practices typical of traditional catchment management. These findings support research by Cook (2013b) which highlighted how practices of traditional management persist due to the embedded nature of traditionally grounded policies and practices which shape emergent catchment organisations such as the GtTP.

The dominance of traditional, top-down approaches is demonstrated by the establishment of the governance arrangements for the catchment. The translation of “*The purpose of the Partnership is to be representative of stakeholders and the community [... and to] work together to [...] meet the vision and objectives for the Twizell burn*” (Groundworks NE and Cumbria, 2015, p. 126) into an aim of undertaking management “*through community engagement*” (GtTP, Personal

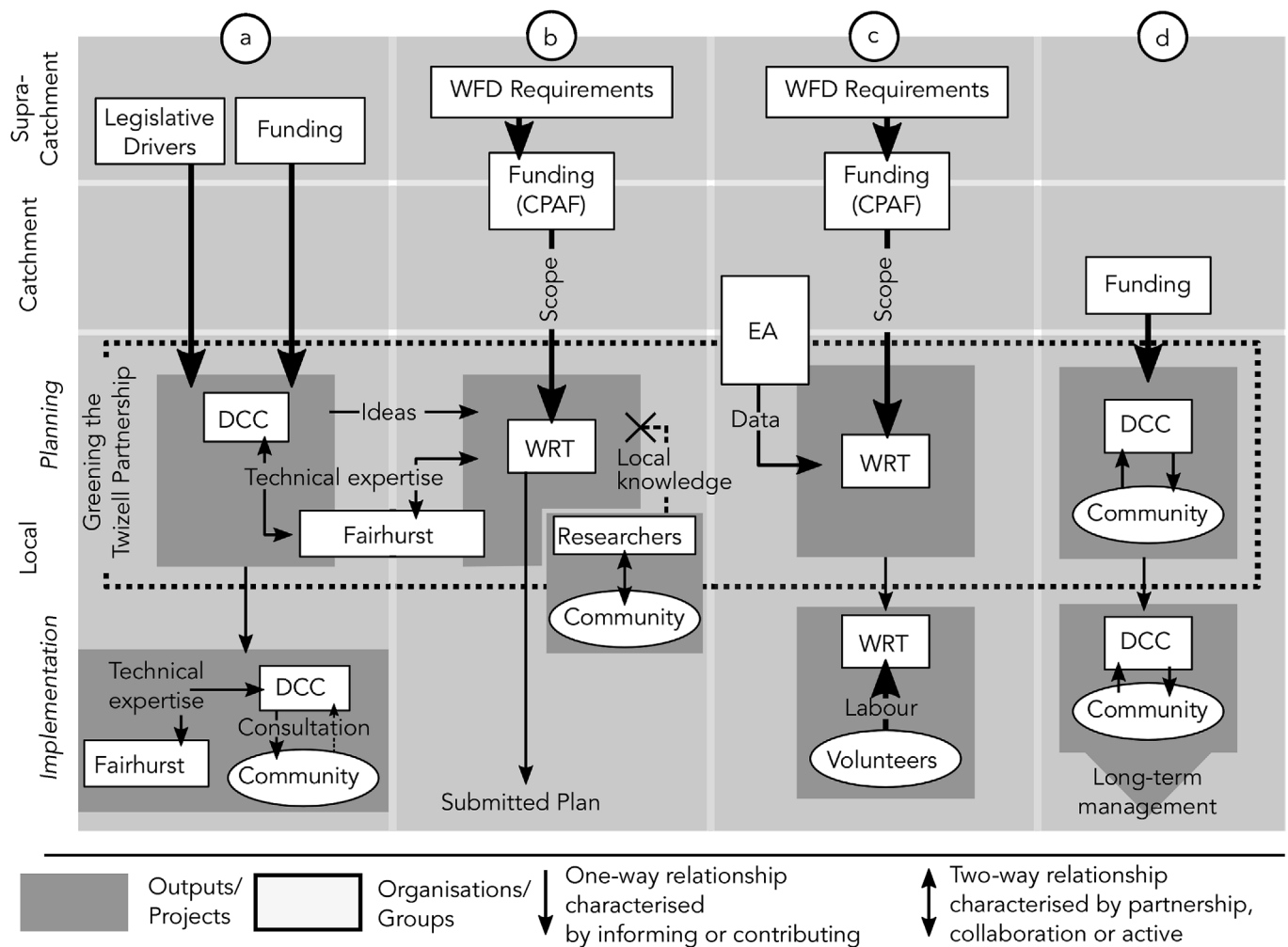


Fig. 5. Characterising the nature of public participation in the planning, implementation, and outcomes of catchment interventions carried out by the GtTP using Plummer and FitzGibbon's (2004) conceptual model of co-operative management. Interventions mapped are (1, 3, 4) Upper Catchment Works, (6, 7) South Moor Regeneration Works, (8) South Stanley Sustainable Drainage Project, (9) South Moor Heritage Trail, (10) Fish Passage Works, and (11) Habitat Improvements. Further details of these interventions can be found in the [Supplementary Information to this paper](#).

Communication) represents a significant shift from a participation-focused philosophy to one much more reminiscent of traditional management. Additionally, although “community engagement” was identified as a principle aspect of the GtTP's aim, the way in which the working practices of the partnership were operationalised acted to close down planned participatory activities. The role of local communities was limited to that of providers of information, with activities dominated by ‘expert-led’ practices (Fischer, 2000), and the practices of the GtTP to traditional consultation (Greening the Twizell Partnership, Personal Communication). Informing and consulting represent a low degree of power transfer in the decision making process (Fig. 1), and formal processes are typical of traditional management (Warner, 2006).

The dominance of traditional management approaches is also demonstrated by the practices of participation evident in the interventions planned and implemented by the GtTP. Fig. 5 maps the nature of participation demonstrated onto Plummer and FitzGibbon's (2004) multi-dimensional model of participation (Fig. 1), and shows that interventions have a very limited local control (Plummer and FitzGibbon, 2004) at almost all stages of the planning, implementation and outcomes of each intervention. For example in the Upper Catchment Works (Fig. 5 Nos 1, 3, and 4), participation is limited to the implementation phase with the informal use of volunteers. In contrast, the South Stanley SuDS intervention carried out by Durham County Council (Fig. 5 No 7) was characterised by formal processes of consultation at all stages, intended

to inform expert-led decision-making. Only one project, the South Moor Heritage Trail (Fig. 5 No 9), demonstrated participatory practices and local control of both the planning and implementation stages, as well as potentially longer term participatory outcomes. This analysis also shows the advantages of using a multi-dimensional model of participation over Arnstein's (1969) relatively simplistic ladder of participation, as the original ladder would be unable to differentiate between these two practices of management, focusing instead predominantly on the outcomes which are largely the same in both cases.

5.1. Vertical integration in the practices of management of the GtTP

The driving top-down policy, CaBA, uses the sub-catchment as the key scale for the implementation of community-led, participatory activities. However research findings from our community-focused research and activities to develop the Green Infrastructure Masterplan demonstrate that these aspirations are not delivered. This bottom-up research indicated a broad understanding and engagement with the catchment of the Twizell Burn from local communities. An emergent aspiration for participation and local control related to a range of issues which extended widely beyond the relatively narrow focus of the GtTP was also evident.

We explain this apparent disjuncture between policy, emergent aspirations for participation, and the practices of participation

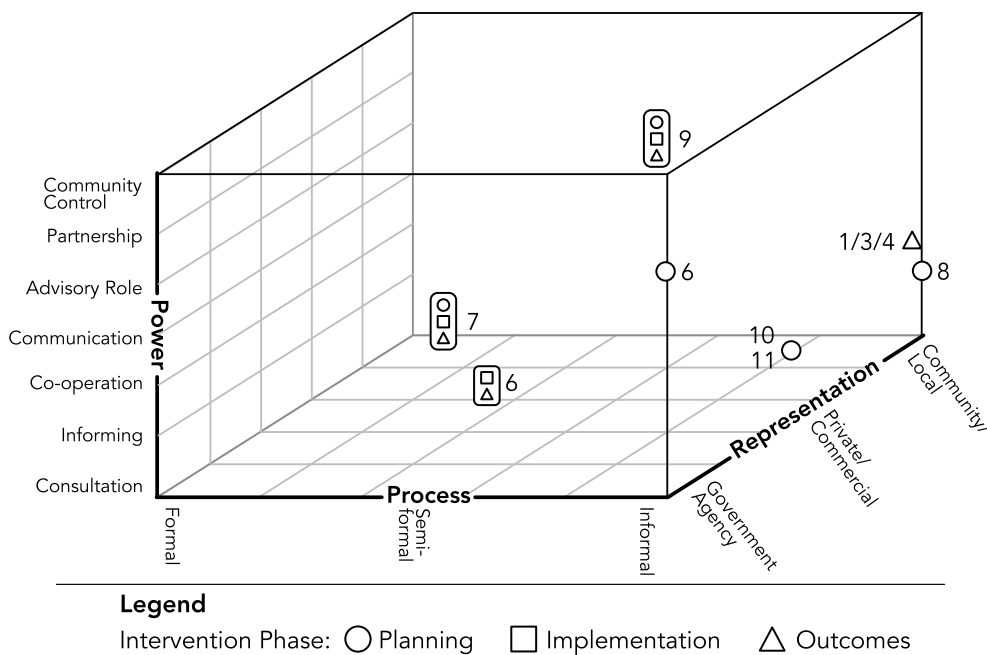


Fig. 6. Mapping the vertical interplay between drivers and actors at different scales within the management process in the Twizell Burn. Interventions mapped are (a) South Moor Regeneration Works, (b) South Stanley Sustainable Drainage Project, (c) Upper Catchment Works, and (d) South Moor Heritage Trail. The actors referred to within the figure represent the main agencies within the GtTP discussed in Section 3.

demonstrated by the GtTP by exploring the vertical interplay between the drivers of management and participation occurring at different scales within the management process (Watson, 2014; Young, 2006). Young (2006) argues that vertical interplays are interactions between management systems occurring at different scales; in this case the local, catchment, and supra-catchment scales (Fig. 2). These management systems have different policy instruments, systems, and associated behaviours (Watson, 2014). Contrasting systems at different scales can result in differing outcomes depending upon the relationship between the scales. Young (2006) proposed five potential modes of interaction characterised by their degree of integration, ranging from the dominance of a higher level system through to the integration of two systems resulting in systemic change.

Fig. 6 maps four of the interventions undertaken by the GtTP against Young's conceptual model, exploring drivers and principle actors at each scale to illustrate the vertical interplays in each case. Interventions (a-c) represent the majority of the interventions carried out by the GtTP, whilst (d) shows the South Moor Heritage Trail; the only intervention to achieve meaningful local participation. Results indicate that the routine practices of the GtTP are characterised by a dominant vertical interplay (Young, 2006), with participation at the local level dominated by supra-catchment drivers. Two principal sources of drivers are apparent depending on the focus of interventions. For WRT-led projects (Fig. 6a and b), the WFD acts as the driver, establishing top-down objectives for the achievement of minimum water quality standards for the Twizell Burn (Voulvoulis et al., 2017). These supra-catchment objectives are translated to the local level through the provision of project funding, provided in this case by the Catchment Partnership Action Fund (CPAF) (Defra, 2016). This funding is heavily controlled and provided only to projects targeted at WFD compliance. It provides funds for immediate capital expenditure and not for ongoing maintenance or engagement work. Use of this funding source forced WRT to maintain tight control of the planning and implementation of these interventions (Cook et al., 2013b; Mees et al., 2017) since the inclusion of unfocused local aspirations represented a significant barrier to obtaining the funding. Hence WRT was unable to use the data collected during the South Stanley SuDs project as, although the data highlighted the potential for a wide-ranging, locally controlled project with multiple benefits, this was not achievable through CPAF funding. Instead, WRT was forced to adopt a model of participation that, following Plummer and FitzGibbon's (2004) model (Fig. 5 No 8),

undertook engagement as an informal process with very limited representation, with only those who could contribute relevant knowledge, skills, or labour asked to participate, and no transfer of decision-making power. The lack of long-term involvement by WRT in these interventions, dictated by the use of CPAF funding, meant that there was no potential for these limited participatory practices to develop into anything further (Schild, 2018).

For DCC-led urban regeneration projects (Fig. 6a), supra-catchment legislation, including the Planning Act 2008 and Localism Act 2011, dictates how the council, as spatial planning authority, must function (Landmark Chambers, 2014; Ministry of Housing, Communities & Local Government, 2017). This legislation is grounded in traditional approaches to consultation, with mandated formal practices to demonstrate due process in the event of planning disputes (Blowers, 2017). Evidence of these approaches are seen in the formal practices adopted during the South Moor Regeneration Works, with only a low transfer of power through formal processes, although representation is widespread within the local area (Plummer and FitzGibbon, 2004). Participation is once again a barrier to achieving interventions, albeit different to that experienced by WRT. Delivery of statutory duties means DCC practices are not aligned with deeper community participation, resulting in a practical barrier in terms of limited time and resources (Cook et al., 2012). The subsequent development of a semi-formal, co-operative relationship between DCC staff and local residents demonstrates the benefits of participation and the willingness of DCC staff to adopt a more flexible approach to participation when it is clearly beneficial to their interventions.

The only project with a deeper participation and local control was the South Moor Heritage Trail since the vertical interplay is not dominated by supra-catchment drivers with top-down objectives (Fig. 6d). Local participation here was not a barrier, but a driver. The project was therefore able to develop a participatory model closer to the collaborative ideals of ICM (Marshall et al., 2010), with high levels of local representation through an informal and ongoing process and the dispersion of decision-making power to local groups; both in the planning and long-term management of the intervention.

5.2. Horizontal integration in management practices

Whilst the results indicate limited success in achieving vertical integration, they demonstrate the emergence of a successful form of

collaborative, horizontally integrated management between members of the GtTP (Varis et al., 2014). Projects, regardless of their supra-catchment drivers were all funnelled through the GtTP (Fig. 6) which enabled the group to act as a collaborative forum in which a degree of social learning (Allen et al., 2011; Collins and Ison, 2009), along with development of shared goals could be achieved between representatives of traditionally discrete agencies. This is evidenced through the development of the original Green Infrastructure Masterplan, which envisioned a systems-based approach to the management of the Twizell Burn and the development of a range of interventions targeting ecological and socio-ecological systems. Collaboration between different agencies in the sharing of ideas, expertise and data occurred (Margerum, 1999), for example the use of DCC project data arising from the South Moor Surface Water Management Plan used to inform the South Stanley SuDS project (Fig. 6a and b). However, this collaboration was limited and based mainly on personal relationships developed between specific individuals within the GtTP, including long-standing professional relationships. One aspect where collaboration was unable to achieve more effective systems working and better vertical integration, is in breaking out of the path dependency (Kirk et al., 2007) dictated to each agency by its supra-catchment drivers. This reflects the fact that social learning was undertaken on an individual level between specific members of the GtTP, and was not representative of wider institutional processes of social learning. More ‘official’ processes, or deeper relationships between individuals from professional organisations would be necessary for the agencies represented within the GtTP to break out of their traditional management paths. However, the development of these collaborative forms of working offers hope that further development of these relationships might facilitate more diverse working practices. Agencies would also be able to call on a wider suite of funding sources (Cook et al., 2013b), thereby reducing the dominant vertical interplay evidenced by this research. Reducing the dominance of supra-catchment drivers on local practices would remove the barrier of participation demonstrated here. The emergence of bottom-up aspirations for participation would be an asset to planning, delivering, and maintaining locally relevant and integrated management interventions.

6. Conclusions and recommendations

Catchment management has been ostensibly revolutionised by the participatory principles of ICM. Policies mandating citizen participation in planning and decision-making are now widespread, for example the Water Framework Directive, with the management system conceptualised by nested cycles of partnership working (Fig. 2). However, nearly twenty years after the WFD was implemented across the EU widespread research has shown that catchment management at the local, sub-catchment scale remains dominated by traditional, top-down approaches which exclude local communities from any meaningful participation in catchment management. These practices result from a dominant vertical interplay between supra-catchment drivers and local practices which restricts vertical integration between agencies and communities within the catchment. Participation is limited in either power transfer and/or representation (Fig. 5) by the tightly controlled scope of catchment interventions, designed to meet strict funding criteria set at the supra-catchment level, or by the processes used by statutory bodies for formal consultation, again dictated from the supra-catchment level.

Hence despite a policy aspiration for integrating bottom-up participation into catchment management, emergent participatory movements, such as that shown in the Twizell Burn, which are characterised by multiple and complex knowledges and aspirations for management activities, remain obstacles to achieving supra-catchment objectives. Only where these supra-catchment drivers were absent did deeper participatory practices emerge.

The results presented here show the emergence of a greater degree

of horizontal integration between agencies, allowing traditionally distinct sectors of management activity to be brought together. By working more closely together, opportunities to exploit or share new funding sources outside of their traditional domains may be opened up, potentially enabling time and flexibility for greater vertical integration to emerge. Although this is positive, catchment groups in other areas must navigate different vertical interplays depending on their local circumstances, and therefore emergent horizontal integration cannot be relied upon to drive vertical integration and the meaningful integration of communities into environmental decision-making.

Instead of acting as a barrier to implementing management, local knowledge and participatory aspirations should be an opportunity to develop effective and locally driven management practices. Further work is necessary to move participatory activities away from the low-power-low-representation or low-power-formal-process models demonstrated in this research, in particular:

1. The supra-catchment governance structures which currently control catchment management at the local scale must be challenged and restructured. Meaningful participation within ICM requires time, to establish informal, trusting relationships with local communities, and flexibility of process, to work together with emerging participatory movements. Future practice and research in ICM should explore how local-level governance structures can be established, to diversify practices of management, reduce the influence of the supra-catchment drivers, and revive meaningful localism.
2. The ways in which participatory governance of local environmental issues might be undertaken should be examined to demonstrate how management organisations can enhance their work through meaningful vertical integration. The policies and practices of traditional governance exclude local knowledges as ‘unscientific’ and incompatible with the scientific, expert-driven management practices (Eden, 1996). However, research has long challenged this view (Wynne, 1996).
3. To support the establishment of more participatory catchment governance structures, research should demonstrate: (i) how the credibility of different information sources can be assessed; (ii) how alternative knowledges can be used within existing frameworks of knowledge creation to inform decision-making; and (iii) how new mechanisms for social learning and shared decision-making can be established to implement the renewed localism needed in ICM practice.

Supra-catchment policies such as the WFD have fundamentally altered how catchments are managed, attempting to encourage the bottom-up management of catchments through participatory practices. However, this research has demonstrated, nearly twenty years after the WFD came into force, the difficulties of changing embedded practices of management dictated by a complex and interlocking array of drivers operating on different actors and at different scales within the management cycle. Only by addressing both policy and governance at the supra-catchment level, to encourage flexibility and self-determination at the local level, and developing tools and practices, to bring together alternative knowledges and perspectives, can this disparity be overcome and the participatory culture of ICM be embedded within catchment management practice.

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Data

Data presented in this manuscript can be obtained by contacting ER.

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Appendix A. Supplementary data

Supplementary data related to this article can be found at <https://doi.org/10.1016/j.jenvman.2018.09.024>.

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